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United States Patent [19]
DiPiazza et al.

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[45] **Date of Patent:** **Feb. 22, 2000**

[54] **METHOD AND APPARATUS FOR
ENHANCING OPTICAL CHARACTER
RECOGNITION**

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5,642,435 6/1997 Loris 382/229

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A. Moore, "The Forms Processing Paradigm Shift," Imaging
Magazine, Mar. 1995, pp. 84-106.

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[21] Appl. No.: **08/949,312**

[57] **ABSTRACT**

[22] Filed: **Oct. 14, 1997**

[51] Int. Cl.⁷ **G06K 9/03**

[52] U.S. Cl. **382/309; 382/229**

[58] Field of Search **382/309-311, 229-231,
382/176**

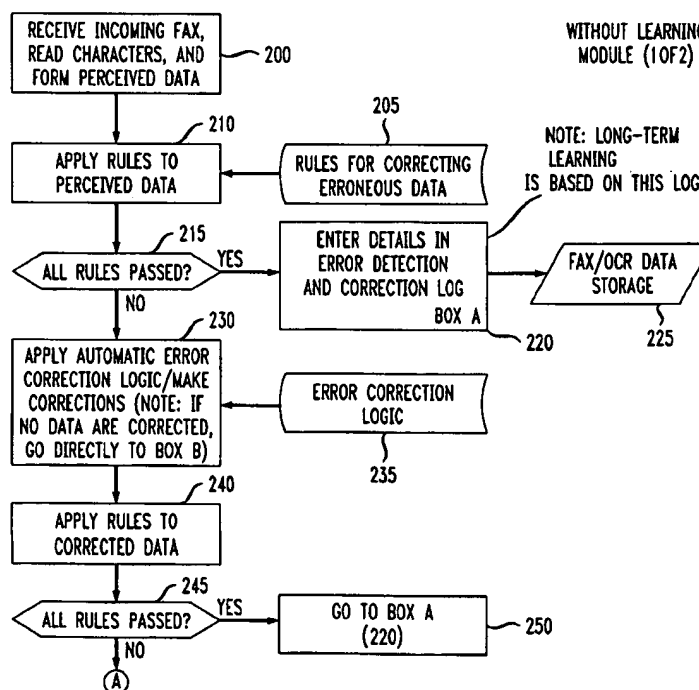
A method and apparatus for enhancing optical character recognition comprises a data processor and memory for maintaining an error detection and correction log. The data processor maintains a memory table of a plurality of rules for generating a rule base determined by recognition of a particular context type of an electronic bit-map portion. The appropriate rule base comprises rules and combinations of rules for application to bit-map portion data. A rule, a rule base or data may be selected and obtained from an internal or external memory. Upon application of the rule base, the error detection and correction log maintains a record of clear errors, corrected data, failed rules of the rule base and the original bit map. Possible errors are flagged and clear errors are automatically corrected provided a confidence level in the correction is reached or exceeded. Through validation by a source or from operator intervention, real-time learning is obtained from detecting and/or correcting errors or updating the rules of the rule table and the data upon which they operate. Through recognition of patterns of errors in the error detection and correction log, new rules may be generated for storage in the rule memory table, erroneous data corrected or incomplete data of the received forms or data fields themselves completed through context based analysis.

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33 Claims, 5 Drawing Sheets



US-PAT-NO: 6028970
DOCUMENT-IDENTIFIER: US 6028970 A
TITLE: Method and apparatus for enhancing optical character recognition

Brief Summary Text - BSTX (5):

Referring to FIG. 1A, there is shown a process flow chart for known optical character recognition systems. The example shown involves receipt of incoming facsimile data, for example, at a facsimile machine or a personal computer. Similar reference characters denote similar steps throughout FIG. 1. Optical Character Recognition (OCR) 105 is employed to translate electronic bit-maps, for example, representing incoming facsimile data received at step 100 into computer characters. The original may comprise machine generated characters or symbols or graphic elements such as picture elements of a photograph or may comprise human hand-written characters, symbols or graphic elements. Bit-maps are simply digital representations of such data appearing in an original document or other tangible medium of expression or comprise digital copies thereof. An electronic bit-map, for example, may result from the electronic scanning of an original for facsimile transmission over telecommunication lines received into a facsimile machine or personal computer or other device at step 100. The density of bits in a contiguous cluster of bits of a bit-map portion may represent an alphabetic character or other symbol that may be computer recognizable.

Brief Summary Text - BSTX (9):

Referring to FIG. 5, which comprises a sample order form of a make-believe corporation, XYZ Corporation, the taxonomy of some simple rules and types of rules will be illustrated by way of some specific examples from the depicted form. A first type of rule is an instance verifier. These rules require that the proper data fields be populated. For example, if the NAME field 500 on the facsimile form is not filled in, a rule of this sort is failed. Another example is if neither the "Requesting our newest catalog" field 501 or the "Ordering merchandise" field 502 is checked, a rule of this sort is failed.

Detailed Description Text - DETX (3):

Today, computers, from large scale main frame computers to personal computers, typically comprise not only keyboards, displays, data processors, even, parallel data processors, random access memory for work-space storage and more permanent hard disc, floppy disc or compact disc data storage but may comprise data modems, facsimile cards, video cards, sound cards and other plug-in cards for, for example, graphics, microphones, cameras, speakers and document scanners. The facsimile card may also comprise a separate processor and memory for temporarily storing a received facsimile electronic bit map or may utilize the memory resources of the personal computer with which it is associated. When combined with fax capability, a computer typically comprises optical character recognition functionality for translating a received electronic bit-map portion into character, symbol or graphic element data of a known computer alphabet. A computer typically communicates with a separate printer for printing the received facsimile.

Detailed Description Text - DETX (4):

Referring to FIG. 1D, there is shown a block schematic diagram of optical character recognition apparatus according to the present invention. The present invention may be implemented in a facsimile card, a facsimile card associated with a computer, a facsimile machine, a stand-alone OCR device or other device for processing a received electronic bit map or bit-map portion. At a minimum, the optical character recognition device 150 of the present invention must comprise a data receiver 152, a data processor 154 and memory 156 and an optional data transmitter. Associated with the data processor 154 are a plurality of modules of an algorithm for performing the OCR processes according to the present invention. All these elements may be implemented suitably in hardware, firmware or software at the discretion of a design engineer, for example, for efficiency or cost purposes, or over time, for example, as memory costs decrease, processing speeds increase and other factors change.

US-PAT-NO: 6028970

DOCUMENT-IDENTIFIER: US 6028970 A

TITLE: Method and apparatus for enhancing optical character recognition

Detailed Description Text - DETX (7):

It is a further principle of the present invention that there may not be sufficient memory 156 or other resources locally to assemble appropriate rule bases for various context types. For example, there may be limited memory resources in a fax card of a personal computer. Now referring to FIG. 1C, there is an embodiment similar to the embodiment of FIG. 1B but proposing additional steps 130 and 135 which substitute for step 120 of FIG. 1B. It may be necessary to even go beyond the boundaries of the facsimile card, personal computer, facsimile machine or related device housing the present invention for assembling a rule base for a context type. For example, a postal address, postal/zip code directory table may be most conveniently stored as a shared resource for application by many optical character recognition devices either locally or remotely and so information obtained through appropriate Internet, private line or switched data transmission services. Other examples that come to mind include credit card number validation services, banking data services, telephone number/area code data verification services and the like. In order to obtain access to external memory, an optional data transmitter 158 becomes a required element of OCR device 150 of the present invention.

US Reference Patent Number - URPN (9):

5235654



US006891972B2

(12) **United States Patent**
Kaneda

(10) **Patent No.:** **US 6,891,972 B2**
(45) **Date of Patent:** **May 10, 2005**

(54) **COMMUNICATION SYSTEM AND
CONTROL METHOD THEREOF, AND
COMPUTER-READABLE MEMORY**

(75) **Inventor:** **Kitahiro Kaneda, Yokohama (JP)**

(73) **Assignee:** **Canon Kabushiki Kaisha, Tokyo (JP)**

(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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(21) **Appl. No.:** **09/212,434**

(22) **Filed:** **Dec. 16, 1998**

(65) **Prior Publication Data**

US 2002/0061137 A1 May 23, 2002

(30) **Foreign Application Priority Data**

Dec. 19, 1997 (JP) 9-351710
Dec. 19, 1997 (JP) 9-351711
Dec. 24, 1997 (JP) 9-355761
Dec. 25, 1997 (JP) 9-358518
Dec. 25, 1997 (JP) 9-358519
Dec. 25, 1997 (JP) 9-358520

(51) **Int. Cl.⁷** **G06K 9/00; G06K 9/68;
G06F 15/16**

(52) **U.S. Cl.** **382/187; 382/219; 709/203**

(58) **Field of Search** **382/186, 187,
382/188, 190, 217, 218, 219; 709/201,
203**

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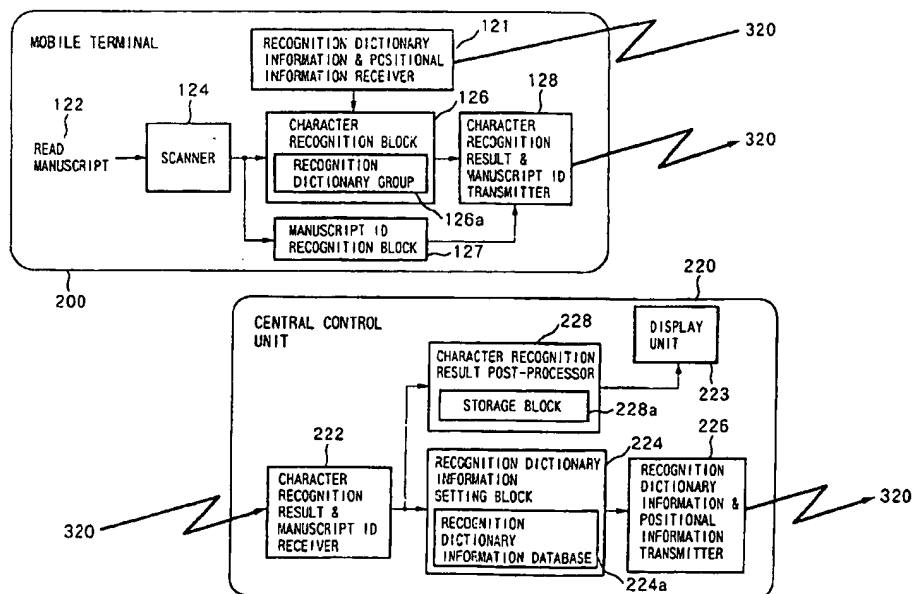
Primary Examiner—Mehrdad Dastouri

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Scinto

(57) **ABSTRACT**

A mobile terminal reads a read manuscript as image data. A character recognition block performs character recognition from the image data, which is read, on the basis of a threshold for judgement of unrecognizableness. A character recognition result is transmitted to a central control unit, or the threshold for judgement of unrecognizableness is received from the central control unit in a threshold receiver. On the other hand, the central control unit receives the result of character recognition from the mobile terminal, or transmits the threshold for judgement of unrecognizableness from a threshold transmitter to the mobile terminal. Furthermore, the central control unit controls the threshold for judgement of unrecognizableness with a threshold controller.

21 Claims, 17 Drawing Sheets



US-PAT-NO: 6891972

DOCUMENT-IDENTIFIER: US 6891972 B2

****See image for Certificate of Correction****

TITLE: Communication system and control method thereof, and computer-readable memory

Detailed Description Text - DETX (123):

In addition, the present invention can be applied to a system composed of plural equipment (for example, a host computer, interface equipment, a reader, a printer, etc.), or single equipment (for example, a copy machine, a facsimile, etc.).

US Reference Patent Number - URPN (1):

5235654



US006177934B1

(12) **United States Patent**
Sugiura et al.

(10) **Patent No.:** **US 6,177,934 B1**
(45) **Date of Patent:** ***Jan. 23, 2001**

(54) **SERVER DEVICE AND IMAGE PROCESSING DEVICE**

(75) **Inventors:** **Susumu Sugiura, Atsugi; Yoshikazu Yokomizo, Yokohama; Yoshinobu Mita, Kawasaki; Makoto Takaoka, Yokohama; Mitsumasa Sugiyama, Kawasaki; Shigetada Kobayashi, Tokyo; Junichi Shishizuka, Kawasaki; Tsutomu Negishi, Tokyo; Osamu Yamada, Yokohama; Yukari Toda, Yokohama; Kazuhiro Saito, Yokohama; Masanari Toda, Yokohama; Yasuhiko Hashimoto, Tokyo; Yasuo Fukuda, Yokohama, all of (JP)**

(73) **Assignee:** **Canon Kabushiki Kaisha, Tokyo (JP)**

(*) **Notice:** This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) **Appl. No.:** **08/182,599**

(22) **Filed:** **Jan. 18, 1994**

(30) **Foreign Application Priority Data**

Jan. 18, 1993 (JP) 5-021705

(51) **Int. Cl.⁷** **G06K 15/00**

(52) **U.S. Cl.** **345/335; 345/339**

(58) **Field of Search** **395/110, 101, 395/114, 112, 111, 117, 115, 106**

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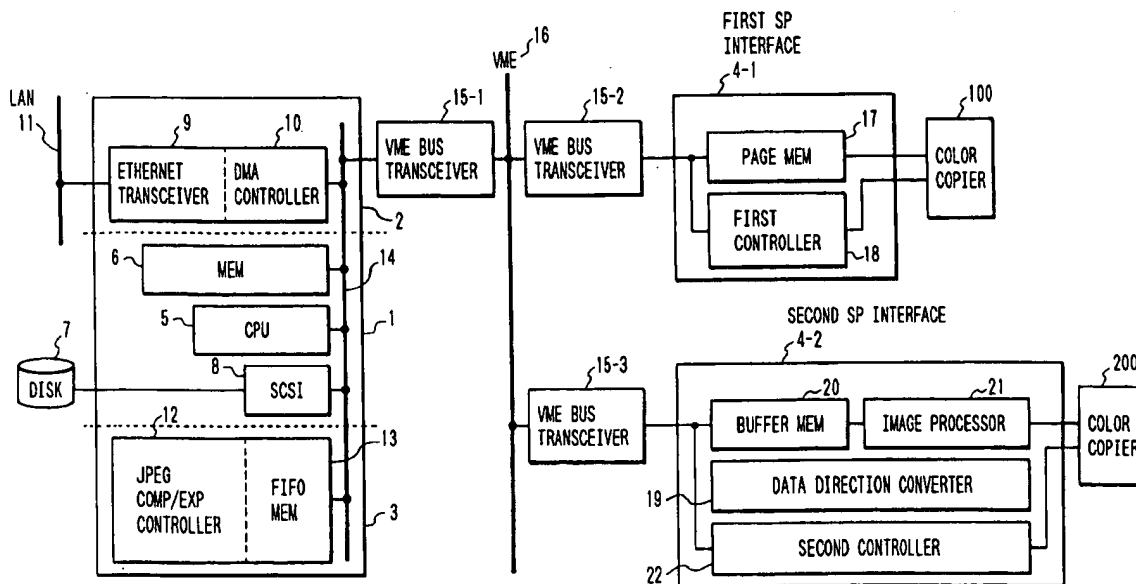
Primary Examiner—Steven Sax

(74) **Attorney, Agent, or Firm**—Fitzpatrick, Cella, Harper & Scinto

(57) **ABSTRACT**

A system enables the reading characteristic of an image reader in a network to be recognized by a host computer. The SP server device transfers the reading characteristics of a plurality of scanner printers to a designated client host computer and through a network.

23 Claims, 72 Drawing Sheets



US-PAT-NO: 6177934

DOCUMENT-IDENTIFIER: US 6177934 B1

****See image for Certificate of Correction****

TITLE: Server device and image processing device

Detailed Description Text - DETX (468):

Referring to FIG. 62, there is depicted a block diagram illustrating the construction of communication control between the server (image I/O controller) and the image I/O apparatus which demonstrate an embodiment of the present invention. There may be connected as the image I/O apparatus a plurality of color printers or color scanners or a plurality of color scanner/printer apparatuses each of which is constructed integrally with a color scanner and a color printer. The image I/O controller may be an integrated I/O apparatus in a network environment composed of a copying machine, a FAX, and a printer, etc.

Detailed Description Text - DETX (501):

In the same figure, numerals 2201A, 2201B designate host computers each of which outputs printer data corresponding to a specific language to the server 2202 through the network 2201. Numeral 2203 designates a spooler which stores the printer data received through the network 2201 following control data in a spooler 2203 described later. Numeral 2204 designates a first color printer which outputs spooled printing data communicating with the server 2202. Numeral 2205 designates a first color printer which outputs spooled printing data communicating with the server 2202. The image I/O apparatus may include a plurality of color printers or a plurality of color scanners or a plurality of color scanner/printer apparatuses composed of integrally color printers or color scanners all connected thereto. The image I/O apparatus may be an integrated I/O apparatus in a network environment constructed with a copying machine, a FAX, and a printer, etc.

Detailed Description Text - DETX (533):

Although in the above-described embodiment the description was done for the case wherein a data processed image was outputted from an image I/O apparatus connected with the server (image I/O controller) on the network on the basis of the analysis result of printing data received through each host computer, the present invention may be applied to an image forming apparatus connected in 1:1 with the host computer. The image I/O apparatus may be an integrated I/O apparatus in a network environment which comprises a copying machine, a FAX, and a printer, etc.

Detailed Description Text - DETX (626):

Further, the aforementioned image I/O apparatus may be an integrated I/O apparatus in a network environment composed of a copying machine, a FAX, and a printer, etc. Further, an image I/O controller (server) with above described embodiments may be constructed such that a host computer or an image I/O apparatus (integrated I/O apparatus) has a function of the image I/O controller. For example, various programs in the SP1 of FIGS. 2A and 2B may be stored in a floppy disk or a hard disk and they may be attached to a host computer or the image I/O apparatus for use of, or they may previously been stored in a memory of a host computer or an image I/O apparatus for use thereof to achieve the same operations as described above.

US Reference Patent Number - URPN (5):

5235654